Technical Research Note 241

AD

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ABSTRACTS OF BESRL RESEARCH PUBLICATIONS -- FY 1971

Emma E. Brown

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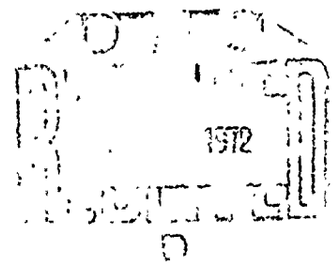

U. S. Army
Behavior and Systems Research Laboratory

December 1971

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BEHAVIOR AND SYSTEMS RESEARCH LABORATORY

An activity of the Chief, Research and Development

J. E. UHLANER
Director

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Included are descriptions of 16 Work Units covering activities reported in the 29 abstracted publications. Included also are a list of depository libraries in universities and metropolitan centers, and a listing of the U. S. Army personnel programs utilizing psychological research test products of the Behavior and Systems Research Laboratory.

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*Evaluation--systems effectiveness						
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Statistical analysis						
*Psychometrics						
Differential classification						
Image interpretation						
Intelligence systems						
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Technical Research Note 241

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ABSTRACTS OF BESRL RESEARCH PUBLICATIONS -- FY 1971

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December 1971

Personnel Management Research--Selection
Personnel Management Research--Manpower Management
Human Performance Experimentation
Manned Systems Research

DIRECTOR

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FOREWORD

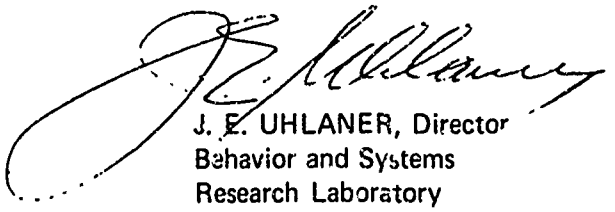
The present Technical Research Note continues the series of abstracts which began with Fiscal Year 1957. The series provides a synopsis of research efforts which reach either final or interim reporting stage during each fiscal year.

A substantial portion of the end-products of BESRL's research takes the form of psychological testing instruments to aid in the selection, classification, and utilization of Army personnel. About 30 Army personnel programs make operational use of over 100 research test products. Estimates of the number of personnel tested in the various programs during FY 1971 appear as the final section of this publication.

Simulation models developed by BESRL through operations research modeling assist Army personnel management in evaluating and deciding upon policies for the selection, allocation, training, and career progression of officers and enlisted men, as well as in planning future manpower policy. Through computerized programs, models are applied in the solution of Army personnel management problems. The products are increased knowledge of the effect of procurement, distribution, training, and reassignment policies on manpower quality, and comparison findings on alternative policies.

BESRL's human performance experimentation yields findings bearing on behavioral functions common to a number of Army systems. Typical products are improved operating procedures, work methods, and supervisory practices which enhance the performance of individuals within the system.

Manned systems research as conducted by BESRL had as its principal objective the enhancement of total system effectiveness through research on human performance. Scientific findings on human capabilities and performance under varying conditions within the system--findings which have implications for systems design, development, and use--constitute the end-products.



J. E. UHLANER, Director
Behavior and Systems
Research Laboratory

ABSTRACTS OF BESRL RESEARCH PUBLICATIONS - FY 1971

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INTRODUCTION

BESRL RESEARCH PUBLICATIONS

TECHNICAL RESEARCH REPORTS

BESRL Technical Research Reports are publications describing completed research programs or projects which contribute directly to the solution of Army human factors problems in the broad areas of personnel management and the enhancement of human performance both individual and in the Army's manned systems. The Report is generally divided into two parts--a brief general report to management and a technical supplement.

TECHNICAL RESEARCH NOTES

BESRL Technical Research Notes are of interest primarily to technically trained research workers in the Department of Defense and in other government research agencies. The Research Note presents technical information concerning research methodology or basic psychological and operations research knowledge growing out of the work program.

RESEARCH STUDIES

The Research Studies are special reports to military management, generally prepared in response to questions raised by operating agencies when early answers are needed. Research Studies may include presentations to military management, interim bases for changes in personnel operations, and bases for research decisions. Distribution is usually limited to operating agencies with a direct interest in the content. A related publication is the Research Problem Review, initiated in FY 1971 and issued as a special purpose document.

RESEARCH MEMORANDUMS

BESRL Research Memorandums are informal reports on technical research problems. Research Memorandums include the following types of content: details concerning construction of experimental instruments, fragmentary or incidental data, and methodological developments relating primarily to in-house technical operations. Limited distribution is made, primarily to personnel engaged in research for the U. S. Army Behavior and Systems Research Laboratory.

FY 1971 ABSTRACTS

Abstracts have been prepared for the majority of FY 1971 publications of the U. S. Army Behavior and Systems Research Laboratory. Where a publication has been abstracted, the principal research findings have been described as much as possible in non-technical language. Technical language has generally been used as the most expeditious method of communicating details of research and analysis.

BESRL research publications are numbered consecutively and continuously from year to year in separate series. Research Note 241 identifies by publication serial number all research publications prepared and published by the U. S. Army Behavior and Systems Research Laboratory in FY 1971. Publications issued during the fiscal year include Reports 1165, 1166, 1168, 1169, and 1171, Technical Report S-2, Research Notes 224 through 227 and 231, Research Problem Review 70-1, Research Studies 71-1, 71-2, and 71-4 through 71-9, and Research Memorandums 70-4 through 70-7 and 71-1 through 71-3. The listing includes 5 Technical Research Reports, one Technical Report, 7 Technical Research Notes, one Research Problem Review, 8 Research Studies, and 7 Research Memorandums.

Included are descriptions of 16 Work Units covering activities reported in the 29 abstracted publications, followed by the number of the abstracts of publications under each Work Unit. Included also are a list of the libraries in universities and metropolitan centers in which these publications are routinely deposited, and a listing of the U. S. Army personnel programs utilizing psychological test programs of the U. S. Army Behavior and Systems Research Laboratory.

DISTRIBUTION OF BESRL PUBLICATIONS

Initial distribution of each Technical Research Report and Technical Research Note is made directly by the U. S. Army Behavior and Systems Research Laboratory. Research Reports are distributed primarily to operational and research facilities and their sponsors in the Department of Defense, to other interested governmental agencies, and to the Library of Congress which in turn distributes to depository libraries. Research Notes are distributed primarily to technically trained research workers, including those reached through Library of Congress channels.

Qualified requestors may obtain copies of Technical Research Reports and Technical Research Notes directly from the Defense Documentation Center. Copies may be purchased from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Virginia 22151. In the case of Technical Research Reports and Technical Research Notes, the AD number, when available, has been added for convenience in requesting copies from the Defense Documentation Center or from the Clearinghouse for Federal Scientific and Technical Information.

Copies may also be obtained on loan from depository libraries in many metropolitan and university centers. A list of these libraries appears on Pages 31 through 38.

Research Studies and Research Memorandums are not available for general distribution.

Operational tests are for official use only.

ABSTRACTS

BESRL Research Publications -- FY 1971

TECHNICAL RESEARCH REPORTS

1. TRR 1165. Joanne M. Witt and Adele P. Narva. SIMPO-I. General Matrix Manipulator (GMM). January 1972.

The General Matrix Manipulator (GMM) is a generalized mass-flow computer model developed by the BESRL SIMPO Work Unit for use in evaluating many different military manpower systems. The GMM consists of a modular set of computerized routines which move elements representing groups of persons within and among a variable number of matrices. Movement is controlled by priority-of-fill cards input at simulation time and may be changed during the simulation period. Two time variables can be depicted--for example, time in tour and time in service, or time in grade and time in service.

The GMM is especially useful with diverse systems in that it permits the analyst to make an early response to one-time questions on the effects of policy changes. Problems in the function areas of accessions, assignment, and reassignment, including rotation, distribution, and promotion are amenable to evaluation with such a model.

The modeling capabilities of the present system of computer programs are 1) monitoring of two different time measurements, 2) variable number of main categories of personnel, i.e., groups of tabular displays, 3) variable number of subcategories of personnel--separate tabular displays, 4) optional rules for transferring all or a portion of elements in one table to another table, and 5) variable sized tables--up to 48 rows by 48 columns.

Description of the routines, instructions for model use, and a sample problem are provided.

2. TRR 1166. James H. Banks, Jack J. Sternberg, and John P. Farrell (BESRL) and Charles H. DeBow and William A. Dalhamer (Manned Systems Sciences). Effects of continuous military operations on selected military tasks. December 1970.

The experiment is part of an ongoing research program to improve the effectiveness of the soldier during night operations and in particular his use of night vision devices and sensors. The effects of continuous military operations on soldiers' search performance with the devices were investigated, and the effects on two other combat related tasks (live rifle fire and grenade throwing) were also measured. A subsidiary purpose of the experiment was to determine whether performance with night vision devices could be predicted by scores from a number of tests.

Nine soldiers were tested each week on the following schedule: Day 1--orientation and training; Days 2 and 3--continuous operations testing; Day 4--controlled test; Day 5--recovery testing. Seven groups of nine each were tested. The basic tests of the effects of continuous operations were target acquisition with the Starlight Scope, rifle shooting, and accuracy of grenade throwing. Subjects were kept continuously active on these and other (nonscorable) military activities for nearly 48 hours with no scheduled sleep. After a 24-hour rest on Day 4, the men were again tested to provide data by which to determine whether, if performance is impaired by continuous operations, a 24-hour rest is sufficient to allow for recovery.

The soldiers showed no degradation in performance on any of the tests given. Despite clear evidence of fatigue on the second day of continuous operations, they performed at the same level as on the first day. It was concluded that, when properly motivated, soldiers can perform at a stable level with no loss in efficiency on important combat-related tasks during a 44-hour period.

The cognitive and perceptual tests given in this experiment did not correlate with performance on the Starlight Scope. As the tests covered a wide range of skills and aptitudes, it appears that the individual's efficiency in using the night vision devices is related chiefly to the work methods, procedures, and search techniques employed rather than to perceptual-cognitive differences.

3. TRR 1168. James H. Banks, Jack J. Sternberg, and John P. Farrell (BESRL) and William A. Dalhamer and Donald Vreuls (Manned Systems Sciences). Effects of search area size on target acquisition with passive night vision devices. February 1971.

The experiment is one of a series conducted by BESRL in the area of night operations. Objective of the program is to identify critical factors affecting performance and to develop means of improving human performance in using night vision devices and related sensors. To further the research, BESRL Field Experimentation Unit was established at Fort Ord, California where, in conjunction with and with the support of the Combat Developments Command Experimentation Command, research is conducted on night operations and the effects of continuous military operations. The experiment reported in TRR 1168 was designed to investigate the effects of search area size on soldier performance with night vision devices and to determine the implications of search area size for operational use, basis of issue, and search deployment.

At the rate of nine per night, 135 operators were required to search for targets over areas defined by scan angles of 75°, 35°, and 25°. The terrain, which extended to 1500 meters, was complex and heterogeneous. Targets differing in type, contrast, and mode of presentation were placed at distances of 100-1200 meters from the subjects. Testing was under starlight, half-moon, and full-moon illumination. The devices used were the Starlight Scope (SS), Crew-Served Weapon Night Vision Sight (CSWS), and the Night Observation Device, Medium Range (NOD).

Prior research had indicated that operators fail to detect many targets that are within the capabilities of the devices. In the present experiment, reduction in size of search area generally resulted in improvement in target acquisition. However, degree of improvement was affected by illumination, distance, and target mode as well as by the number of operators using devices and how the men were deployed. Moving and stationary targets were detected equally often when the search area was large, but with reduced area size more moving than stationary targets were detected. Reduction in search area size improved the detection of distant targets more than of close targets. The SS and CSWS, previously found to be of limited value for detection of targets at mid (350-800 meters) and far (800-1200 meters) distances improved considerably in this respect when the search area was narrowed. Improvement resulting from increasing the number of devices used was greatest for wide search areas, particularly under low illumination. For all illumination conditions and search area sizes, increasing the number of operators with devices from one to two produced sizable improvement. Increasing the number from two to three resulted in less improvement. When more than one operator was used, more targets were detected with overlapping search of the entire area than when the area was divided into sub-sectors.

Findings suggest that under certain conditions target acquisition can be improved by reduction in search area size and by use of multiple properly deployed devices. Fractionating the search area into smaller sub-sectors does not as a rule maximize the probability of target detection.

4. TRR 1169. James H. Banks and Jack J. Sternberg (BESRL) and Barry J. Cohen and C. Henry DeBow (Manned Systems Sciences). Improved search techniques with passive night vision devices. February 1971. AD 722 236

The experiment was conducted to determine whether new search techniques and procedures to assure more systematic and comprehensive coverage of the search area and a variable scanning rate can increase the effectiveness of soldiers using night seeing devices. Fifty-four operators were given specialized search training consisting of 1) general search methods which included search pattern and adjustment of speed of search and 2) specific search techniques involving continuous movement of the device with stops only for examination of some object of interest and a discontinuous movement with the device moved in discrete steps. Performance of these soldiers was compared to that of another group who were treated similarly in all respects except that they did not receive the special training on search method and pattern. The two groups were tested on the same terrain. Targets of different type, contrast, and mode were placed in the area at various distances from the soldiers. Search areas (scan angles) of 75° and 35° were used.

The special search training increased the percent detections over base performance for both size search areas. Improvement was much greater on the 35° area (80%) than on the 75° area (35%). With the special training, operator performance on the 75° area (23% detections) was just about equal to that of the operator with standard training on the 35° area (25% detections). Thus, one man who has had the special training could cover a wide area as effectively as two men with standard training, each covering half the area.

For both size search areas, the time required for target detection decreased with the special training. Reduction in search area size did not affect target detection time after special training but decreased time after standard training.

5. TRR 1171. John T. Cockrell (SDC) and Robert Sadacca (BESRL). Training individual image interpreters using team consensus feedback. June 1971.

Most field image interpretation units typically have a relatively large number of inexperienced personnel and a relatively small number of experienced personnel. Some proficiency improvement and maintenance practices are necessary for these personnel, especially for recent graduates of interpretation schools and transferees. BESRL has conducted a series of experiments to develop and test the team consensus feedback method as a technique for maintaining and enhancing the proficiency of individual image interpreters. The essential feature of the method is that interpreters practice in teams, arriving at decisions on target detection and identification by a consensus of the team members.

The present publication summarizes four experiments to determine the effect on interpreter detection and identification skills of a training method using feedback from the agreement team members achieve when they compare and discuss their interpretations. In experiment I, team consensus feedback was compared with precise feedback (prior identifications made by experienced interpreters) and "no feedback" for effectiveness in improving both target detection and target identification. Experiment II studied the effect of team consensus feedback on target detection only. Experiment III evaluated modified team consensus feedback techniques designed to minimize feedback delays. In experiment IV, the nature of learning curves using team consensus feedback techniques was investigated and the most promising procedures identified in the first three experiments were compared.

Team consensus feedback was demonstrated to be an effective method of improving and maintaining image interpreter proficiency in an operational facility. The greatest gains in performance were achieved with a method using three-man teams, heterogeneous in terms of initial proficiency, in which individuals made their initial interpretations individually but were permitted to discuss their identifications freely. In general, low proficiency interpreters made greater gains than interpreters whose initial proficiency was high. There was indication that low proficiency interpreters learned from their collaboration with higher proficiency interpreters. Team methods requiring the continued close association of interpreters from the beginning of search did not lead to overall performance improvement, possibly because high proficiency interpreters precluded effort on the part of less proficient interpreters.

TECHNICAL REPORT

6. TR S-2. J. E. Uhlaner. Human performance, jobs, and systems psychology--the systems measurement bed. October 1970. AD 716 346

The presidential address given by Dr. Uhlaner before the Division of Military Psychology of the American Psychological Association at the annual convention in Miami, Florida in September 1970 constitutes Technical Report S-2. Dr. Uhlaner is the Director of BESRL and the Chief Scientist, U. S. Army Manpower Resources Research and Development Center.

The major hypothesis concerns the way aptitudes, job demands, and surrounding conditions coalesce to yield varying levels of performance.

The conceptual background for the hypothesis includes: 1) a taxonomy of jobs containing cognitive variance (responses more objectively characterized as right or wrong) and noncognitive variance (responses less objectively characterized as desirable or undesirable); 2) the ad hoc nature of values and goals (quality output, safety of operation, quantity output, etc.); 3) the great variety of styles of behavior (authoritarian, forceful, democratic, permissive, cautious, risk-taking, etc.) by which individuals and organizations seek to achieve and do achieve goals.

Styles of behavior and values and goals are considered ad hoc by the investigator. To the extent that such variance enters into criterion determination, it is proposed that for many applied purposes including systems development, the criterion should be a given rather than the yield of preceding predictors, and the criterion should be explicitly specified with respect to both cognitive and noncognitive variance. The systems measurement bed--constructed for research purposes to contain situational tests and exercises--can be designed to yield such criterion measures and measures related to the human factors variables.

And most importantly, in certain jobs (probably more complex or less structured jobs) as performed by groups of individuals whose effectiveness is greater than would be expected based on the usual linear combination of empirically validated aptitude measures, there occurs an intensification of capability that goes beyond the use of a relatively high level of one aptitude to compensate for a lesser level of another aptitude. This major hypothesis, tested and supported in appropriate samples, highlights the complex of performance as a function of abilities. Crucial to productive experimentation in the framework of the systems measurement bed is the participation of performers who are experienced and even "expert" in the job situation under scrutiny.

The theoretical discussion, the hypothesis developed and tested, and the resultant research considerations strongly affirm that the generation of principles for the understanding of pertinent human behavior in certain jobs (e.g., electronics specialists, high level jobs in complex information systems, military commanders and leaders) seems to demand a special research framework. The research framework which meets such a requirement is the systems measurement bed.

TECHNICAL RESEARCH NOTES

7. TRN 224. Emma E. Brown. Abstracts of BESRL research publications--FY 1970. October 1970. AD 718 753

Research publications prepared and released by BESRL in FY 1970 are identified both by publication serial number and AD number. Included are 7 Technical Research Reports, 13 Technical Research Notes, 8 Research Studies, and 4 Research Memorandums. Work Units included in BESRL's Work Program for FY 1970 are briefly described and references to relevant abstracts are noted by number. Provided also are a list of depository libraries furnished copies of BESRL Technical Research Reports and Technical Research Notes and a compendium of information of BESRL test products that are operational in the Army's personnel selection and classification programs.

8. TRN 225. Milton H. Maier. Effects of educational level on prediction of training success with the ACB. (in press).

The Army Classification Battery (ACB) has over a twenty-year period proved effective in predicting success in Army enlisted training courses. However, possible differences in validity for various subgroups of the input population have not been the explicit subject of research. The present analysis was designed to determine whether ACB scores are equally effective as predictors of training success for enlisted input of different educational levels, particularly for significant subgroups such as non-high school graduates and college graduates.

Using data from extensive research on the Army Classification Battery conducted on 25,000 enlisted men in over 100 Military Occupational Specialty training courses, samples of men at each of four educational levels were formed: less than high school graduation, high school graduation, some college, college graduation. ACB scores and final training course grades were analyzed for the various samples to determine whether the predictors are equally effective for the different educational groups. Assumptions underlying the operational use of ACB test scores were tested --equality of standard errors of estimate, parallel slopes of the regression lines, correspondence of intercepts of the regression lines (using the Gulliksen-Wilks analysis of covariance technique). A given increase in ACB test scores was found to result in the same proportional increase in predicted course performance for each of the educational levels. However, the same predictor score resulted in a different level of predicted course performance for the non-high school graduate as compared to the college graduate. The course performance of the college graduate is consistently underestimated and that of the non-high school graduate tends to be overestimated, even though the college graduate has a much higher level of aptitude test score. For the less well educated, the ACB measures predict higher training performance than the individual is likely to achieve. The training performance of enlisted men could probably be predicted more effectively by including level of education in the aptitude area composites used in classification. However, many other factors could enter into the prediction.

9. TRN 226. Michael H. Strub. Evaluation of man-computer input techniques for military information systems. May 1971.

Four configurations of procedures for inputting information into a semi-automated information processing system were evaluated in terms of speed and accuracy. Sixty USMA Prep School enlisted men were given an experimental task requiring each to translate 35 free-text messages into computer-acceptable terminology. Accuracy and speed of two input procedures were each compared under two conditions of verification. In one procedure, the subjects translated the incoming message onto a paper format before transcribing it on a CRT screen (off-line). In the other procedure, the message was transcribed directly on the CRT screen (on-line). In the unverified condition, some men performed the input operation without error check; in the verified condition, two men translated the same message, compared their translations, and resolved differences before entering the information into the data base. Performance under the four experimental conditions was also compared with that using a procedure similar to the procedure used in the 7th Army TOS in which a message is translated onto a paper format and the unverified message is copied on the CRT by the UIOD (user input-output device) operator.

In the present experiment, data input accuracy was significantly increased when free-text messages were translated directly on the CRT screen rather than first filled out on paper formats (11.2% vs 14.8%). Input speed was practically the same under the two methods. When two operators checked each other's translations before the information was entered in the data base, error was reduced by one-third (10.3% vs 15.7%), but the procedure required one third more time (6.81 vs 4.98 minutes). Either procedure was an improvement in accuracy over having the message translated onto a paper format by one "action officer" and then having a UIOD operator copy the format on the CRT and then enter it into the data base. The present study strongly suggests that incoming messages should be translated directly on the CRT screen. Direct CRT input would reduce error while eliminating paper formats and need for the UIOD operator to transcribe the paper formats on a CRT screen. Findings further suggest that, when time and personnel permit, messages should be verified for consistency before the information is entered into the data base.

10. TRN 227. Leon H. Nawrocki. Alpha-numeric versus graphic displays in a problem-solving task. (in press).

To assist commanders and their staffs in the assimilation of tactical information, data must be displayed as efficiently as possible. At present, such information is typically displayed either in tables made up of arabic numerals and letters (alpha-numeric) or on maps employing standard military symbols (graphic). The present experiment was designed to evaluate, in terms of speed and accuracy of information assimilation, alternative display modes for presenting information in an Army information processing system. The immediate objective was to determine if the two display modes affect performance differentially for a range of memory requirements.

At least two circumstances impose memory requirements on a field commander. A limited time to reach a decision may force him to use only his memory of previous information relevant to the problem; or the complexity of the information displayed may impose a severe memory load upon the decision maker. Alpha-numeric and graphic display modes were selected for comparison in the context of two basic task requirements: 1) need to base a decision on memory of information previously displayed versus no memory requirement, and 2) complexity of information to be held in memory (memory load).

No clear-cut advantage in speed or accuracy was noted with either display mode when memory of displayed material was required. When memory was not required, alpha-numeric displays resulted in fewer errors of omission than did graphic displays, indicating that the display mode used in information processing system may influence the relative proportions of different kinds of error made. Hence, choice of display may be primarily one of cost consideration if overall time and accuracy are determinants of system performance. If system output reflects the specific types of error that are produced, then type of display may be of greater importance to the tactical decision.

11. TRN 228. Milton H. Maier. Effects of general ability, education, and racial group on aptitude test performance. May 1971.

In differential prediction, separate regression equations to predict performance are developed for each criterion that can be reliably distinguished. Each criterion places a particular combination of demands on the individual and thus requires a unique profile of aptitudes. In the Army personnel system, as generally in large personnel systems employing differential measurements, the same equations are assumed to apply to all segments of the input population, and the tests are further assumed to provide equally appropriate measures of these aptitudes for all persons.

Even though the Army has been using the ACB effectively for over twenty years and there is no indication that the tests are not appropriate for all input, no research evidence is available to demonstrate conclusively that the tests measure the same things for all subgroups. The present research was conducted to gather evidence on the appropriateness of the ACB for groups categorized by socially significant variables, using data obtained on more than 17,000 men who entered the Army in January 1968. The men were categorized as non-high school graduates and high school graduates, based on information available in Army records. The racial identifications for the present study, Negro and white, were determined by self-reports. The sample was also classified into three levels of general ability on the basis of AFQT scores.

Intercorrelations of the ACB measures were computed for each category and together with means and standard deviations were compared to determine similarities and differences among the subgroups. Also presented is a second set of values for subgroups equated for variability on AFQT.

Results demonstrate the difficulty of drawing accurate conclusions about the effectiveness of tests for minority groups. One result remained invariant--the emergence of the academic and mechanical clusters of tests for all subgroups, supporting the conclusion that the ACB tests measure the same sets of aptitudes in all groups. The specific content of the tests rather than their verbal-nonverbal character appears critical to the contribution each test makes to the aptitude clusters. There were enough differences among test results in the different groups, however, to warrant an extensive research program to find out what differences exist and to determine what impact these have on the Army's selection-classification, training-utilization system.

12. TRN 229. Richard L. Krumm, James E. Robins, and Thomas G. Ryan (Bunker-Ramo). Studies of tactical military decision making: III. Predictor variables and criterion measures. (in press).

Evaluation of human performance in command information systems depends upon relevant and objective performance measures. Such measures permit identification of factors contributing to the overall success or failure of the system as well as to the evaluation of the capabilities of the system or subsystem. Technical Research Note 229 describes research to develop a scenario for a test of tactical decision making and to derive methods for scoring the decision making process (in addition to the decision) which, when validated, will be available for use in manned systems research to improve tactical decision making.

Experimentation was conducted in BESRL's Simulated Tactical Operations System (SIMTOS) facility. A test scenario was prepared and administered individually to 20 senior field grade officers. Acting as division operations officer, each subject was required to write a defense plan for his division sector against an expected attack by two mechanized infantry divisions. Scoring standards were based on lesson plans obtained from the U. S. Army Command and General Staff College at Fort Leavenworth. The scenario was presented using cathode ray tube displays, computer driven typewriters, and random access slide projection equipment. Defense plans were scored using the Command and General Staff College school solutions as criteria.

The practicality of developing a priori scoring standards for complex decision-making tasks was demonstrated. A combination of four predictor scores--experience, ability, decision process pattern, and significant facts--was highly correlated with criterion score. The measure of decision quality developed was helpful in designing a more appropriate scenario for assessing the impact of various command information system variables in a situational setting (the Systems Measurement Bed) provided by BESRL's SIMTOS.

13. TRN 231. Milton H. Maier. Attrition in Ordnance School courses. (in press).

In the present effort to find ways of reducing attrition in Ordnance School courses, attrition is viewed not as an isolated phenomenon but as one aspect of the entire process of classification, training, and utilization of enlisted men. The research deals with the interrelationships of aptitudes, training grades, and performance on the job.

Scores on written and performance tests given at the end of each reporting period in three Ordnance School courses--Machinist, Small Arms Repair, and Fuel and Electrical System Repair--were analyzed in relation to each other, to final course grade, and to scores on the Army Classification Battery tests. Failure rates on written and performance tests during and at end of course were ascertained and analyzed to determine 1) whether written and performance tests provide similar information about the skills and knowledge of the trainees, 2) whether the same or different trainees tend to do well during the different reporting periods, and 3) whether the aptitudes required are relevant to success in the various stages of instruction.

ACB tests had the expected degree of effectiveness in predicting trainee performance (correlation coefficients in the .50's and .60's). Tests in the aptitude areas prerequisite to the courses were the best predictors for the appropriate courses. Failure rates in most written tests were high, sometimes exceeding 50 percent of those completing the course. On performance tests, failure rates were low, under 5 percent except in the Machinist course in which over 20 percent failed some tests. Written and performance tests were inconsistent in respect to individuals passing and failing. Failure rates on tests at early and late reporting periods were also inconsistent.

RESEARCH PROBLEM REVIEW

14. RPR 70-1. Richard L. Krumm, Carlos H. Rowe, and Francis E. Torpey (Bunker-Ramo) and Seymour Ringel (BESRL). Research on tactical military decision making: I. Design of a simulated tactical operations system (SIMTOS). October 1970.

Plans are detailed for the design of an experimental research facility, including hardware and computer software, within the U. S. Army Behavior and Systems Research Laboratory. The program served is in the area of tactical operations systems and is concerned specifically with research on display and information flow in military command and control systems. With the emphasis on tactical operations systems (TOS), the automated system developed for the Seventh U. S. Army provided background data for the simulation. The tactical operations center (TOC) was used as the environmental model and the portion of the BESRL research facility devoted to experimentation in this area is termed SIMTOS.

Conditions necessary for a realistic test facility environment, scenario form and content, and testing practicalities were delineated. On the basis of these, plans were outlined for a sequence of six research phases designed to culminate in a capability to study decision-making behavior during free-play two-sided war games. Used as a vehicle for BESRL research, the SIMTOS can constitute a realistic test environment or systems measurement bed for operations research on decision making performance in command information processing systems.

RESEARCH STUDIES

15. RS 71-1 Isaak D. Orleans. (U) Feasibility of using FTX Gobbler Woods for criterion evaluation of psychological operations officers. FOR OFFICIAL USE ONLY. May 1971.

16. RS 71-2. Francis F. Medland. (U) School and assignment procedures in officer career development. (FOR OFFICIAL USE ONLY). October 1971.

17. RS 71-4. Robert B. Miller (American Institutes for Research). Development of a taxonomy of human performance: Design of a systems task vocabulary. December 1971.

This is one of a series of reports on several alternate approaches to developing and evaluating taxonomic systems for describing human tasks. The goals of the project, conducted by the American Institutes for Research under contract, are 1) to improve generalization of research results about human performance and 2) to develop a common language by which human performance information can be organized for maximum use by both researchers and decision makers in such areas as selection, training, and man-machine system design.

The present document describes an initial attempt to design a new systems task vocabulary in which human beings are considered to be information processors within the total system. The authors previous formulation of a "functional approach" to task description and analysis is reviewed, and a format consisting of four major "dimensions" is presented--discriminable task functions, task content, task environment, and level of learning. The rationale for development of a transactional language for describing and analyzing military tasks and duties is presented, together with a new systems task vocabulary created according to the rationale. Input reception, memory, processing, and output effectors are concepts found useful in developing the set of terms that constitute the systems task vocabulary.

18. RS 71-5. Robert B. Miller (American Institutes for Research). Development of a taxonomy of human performance: A user-oriented approach. December 1971.

A user-oriented approach is proposed for the development of new ways of describing tasks and duties. Man/machine system design applications of this kind of taxonomy are described in the decision areas of human factors engineering, selection, training, and systems characteristics.

Some current laboratory research assumptions and procedures used in developing taxonomies are criticised on the grounds that they are not adequately representative of the real world and do not lead to useful tools. Specific suggestions are presented regarding a modified laboratory approach.

19. RS 71-6. Jerrold M. Levine and Warren H. Teichner (American Institutes for Research). Development of a taxonomy of human performance: An information-theoretic approach. December 1971.

As part of a program to develop theoretically-based language systems (taxonomies) which--when merged with appropriate decision logic and quantitative data--can be used to make improved predictions about human performance, a model was developed by which tasks could be classified so as to permit prediction of performance on new tasks on the basis of data from similar tasks. The model, based on information processing concepts, provides for a systems language common to all tasks. A task is defined as an information transfer between a source and a receiver. It is postulated that classes of tasks are characterized by classes of constraints, and that these constraints can be rationally dichotomized into those acting upon the source (input) or receiver (output) of the information. The model has the potential of predicting performance on tasks that have not yet been researched and for which hardware has not yet been built. Analysis of the potential constraints on the task can be made and related to tasks having similar constraints for which performance data are available in order to predict performance on the new task. This classification scheme can facilitate integration and generalization of human performance research findings.

20. RS 71-7. Alfred J. Farina and George R. Wheaton (American Institutes for Research). Development of a taxonomy of human performance: The task characteristics approach to performance prediction. December 1971.

The present research was conducted to develop an instrument for describing the stimulus, procedural, and response characteristics of tasks. Basic steps in the research were: 1) to develop descriptive characteristics of tasks, 2) to assess the reliability of rating scales devised to measure these characteristics, and 3) to determine if these characteristics represent correlates of human performance.

Major components of a task were identified and treated as categories within which to devise task descriptors. Each of the 19 characteristics described was cast into rating scale format, and the scales were evaluated in reliability studies. Performance measures were abstracted from research described in the literature. Subjects rated descriptions of the tasks on the task characteristic scales, and the extent to which the ratings were related to performance was determined by multiple regression analysis. Significant multiple regression coefficients (.82 and .73) were obtained in two such studies.

21. RS 71-8. Warren H. Teichner and Joan Whitehead (American Institutes for Research). Development of a taxonomy of human performance: Evaluation of a task classification for generalizing research findings from a data base. December 1971.

Research was conducted to evaluate a system for increasing the generalizability of research findings about task performance. A "criterion measure" classification system was applied to existing data concerned with selected training and environmental variables. For certain variables and certain task conditions, the categorization system was effective in predicting human performance across a variety of tasks. Implications for developing a data base are discussed.

22. RS 71-9. George C. Theologus and Edwin A. Fleishman (American Institutes for Research). Development of a taxonomy of human performance: Validation study of ability scales for classifying human tasks. December 1971.

As part of the overall effort to develop a system describing and classifying tasks so as to improve generalization of research results about human performance, several taxonomic systems were developed, each of which appears to have maximum relevance for a different application. The present publication reports on the second of a series designed to explore the development of a task classification system based on the human ability requirements for performance of various tasks. The first study (RS 71-7) presented estimates of the reliability of task rating scales based on major human ability components of task performance. The second study, reported here, was an effort to derive preliminary estimates of the construct and predictive validity of these scales.

To estimate the construct validity, ratings of tasks made by a panel of judges using the ability scales were correlated with factor loadings of these tasks on ability factors established in previous factor analyses. A multiple regression technique was used to determine the extent to which the judges' ratings of the tasks predicted mean performance on the tasks.

Task ratings on the ability scales were significantly correlated with the factor loadings of the same tasks. A set of three ability scales was significantly predictive of task performance ($R = .64$). While findings await cross validation, it was concluded that the task rating scales were validly descriptive of human tasks.

RESEARCH MEMORANDUMS

23. RM 70-4. Roger L. Williamson. Interaction between psychological tests and curricula in the Marine Hull Repairman course. August 1970.

Validity patterns of tests of the Army Classification Battery (ACB) versus final course grades did not differ significantly for two samples of enlisted men--one ($N = 139$) trained in the academically oriented course for Marine Hull Repairman, the other ($N = 56$) trained in a course recently

revised to emphasize learning through performance of specific tasks. High validity for the Classification Inventory, a noncognitive ACB test, in both samples indicated a possible new dimension in the criterion for the revised course.

24. RM 70-5. William H. Helme and Eli Frankfeldt. Analysis of officer performance of an experimenal task: Office Management. September 1970.

Experimental tests relevant to three broad areas of officer assignment--combat, administrative, and technical--were administered to 4,000 officers at entry on active duty in 1961 - 1964, as an important phase of the OFFICER PREDICTION research program. Fifteen to 30 months later, a subsample of 900 of these officers were sent to the Officer Evaluation Center where criterion data were obtained on their performance in a series of situational performance tests administered in a simulated MAAG setting. Resulting data were analyzed to provide scores for use in validating the experimental predictor tests and in deriving dimensions of officer behavior demonstrated in the OEC exercise. The Office Management task was designed to measure the officer's ability to analyze assignment of duties, working arrangements, personnel records procedures, organization and flow charts, and to apply management principles in correcting improper office procedures. Nine content scores and a total task score were derived. Reliability coefficients for eight of the nine scales ranged from .71 to .91. One scale, Changes and Deletions, yielded a reliability coefficient of .21.

25. RM 70-6. Eli Frankfeldt. Comparison of ACB and ASVAB clerical tests for use in the Army Classification Battery. December 1970.

The Coding Speed Test of the Armed Services Vocational Aptitude Battery was evaluated as a possible substitute for the Coding Test now used as the clerical test of the Army Qualification Battery. Comparison was with the Army Clerical Speed Test (ACS) of the Army Classification Battery, since the AQB clerical test was similar to the coding test of the ACB ACS. In a sample of 460 students at the beginning of the Clerk General Course at Fort Jackson, S. C., the Clerical Speed Test of the ASVAB was more valid than the ACS in predicting a clerical training criterion measure (.45 vs .35). The ASVAB clerical test is also easier to administer and score.

26. RM 70-7. Edward M. Sait. Analysis of officer performance on an experimental task: Automotive Inspection. December 1970.

The Automotive Inspection Task is one of five tasks in the technical area of the situational performance exercise administered at the Officer Evaluation Center as part of the OFFICER PREDICTION research program. Data were analyzed to obtain scores representing the principal behavior dimensions of performance in the task and a total score. A total score based on four component scores was established. A composite of four variables, corresponding most nearly to the total score finally adopted had a reliability coefficient of .77.

27. RM 71-1. Edward M. Sait. Analysis of officer performance on an experimental task--Communications Exhibit. April 1971.

The Communications Exhibit Task is one of five in the technical area of the situational performance exercise administered at the Officer Evaluation Center as part of the OFFICER PREDICTION research program. It was designed to measure trouble shooting ability and ability to use technical facilities effectively. Data were analyzed to define factors summarizing the behavior represented in the records and evaluations obtained during performance of the task and to establish an overall score. Nine component factors were identified. Estimated reliability of the composite score is .86.

28. RM 71-2. Milton H. Maier. Analysis of Army recruiting system--Selection and training. April 1971.

Following a quick analysis which showed limited effectiveness of the Recruiter Self-Description Blank as an instrument for identifying men who will make unsatisfactory recruiters ($r = .20$ in an available sample of practicing recruiters), steps for a systems analysis of the Army recruiting system are proposed based on selection, training, and utilization as an interacting system.

29. RM 71-3. Edward M. Sait. Analysis of officer performance on an experimental task: Airfield Layout. April 1971.

The Airfield Layout Task is one of five tasks in the technical area of the situational performance exercise administered at the Officer Evaluation Center as part of the research in the OFFICER PREDICTION program. The task was designed to measure ability in technical assignments as distinguished from administrative and combat assignments. The officer was required to report on three proposed sites for a hasty airfield with respect to their adequacy in meeting tactical, operational, and engineering requirements and also to calculate the length of runway required. Resulting data were analyzed to provide scores for use in validating the experimental predictor tests and in deriving factors of officer behavior in the criterion. A total score based on two component scores--site-report and runway--was formulated which, in spite of low internal consistency measures, was considered fairly comprehensive.

WORK UNITS

U. S. Army Behavior and Systems Research Laboratory

Work Units included in the BESRL Research and Development Work Program for FY 1971 are briefly described. Units are grouped according to research area. Numbers appearing at the conclusion of each description designate publications abstracted or listed on pages 3 through 17.

PERSONNEL MANAGEMENT RESEARCH-SELECTION

Selection research for military personnel management embraces research on screening and classification of enlisted men and on the performance evaluation of both officers and enlisted men for use in assignment, promotion, and advanced training. Findings have implications for manpower planning--for the Modern Volunteer Army, for example--and for the career development of officer leaders. Empirically based information is provided on the impact of mental distribution of enlisted men on the performance of small units, and the tests or other means of early identification of individual assets essential to high level performance in different areas of military activity. In addition to general trainability and potential or acquired capabilities for defined occupational areas, such assets include combat potential, ability to function well as a team member, officer leadership qualities, and career motivation.

Studies to improve enlisted classification have recently centered on interaction between job environment and the predictive effectiveness of classification tests, both operational and innovative. In behavioral evaluation, an important aspect of the research is the development of improved methods of assessing officer performance, including simulation exercises and variations in rating techniques.

Added research effort goes into the development of technical information for use in consultative assistance to staff agencies responsible for procurement and standards policies and to Department of Defense officials for use in manpower studies and programs. Implementation is by such policy and operating agencies as DCSPER, OPO, and USCONARC in programs which include selection for OCS and ROTC, the screening, classification, and job assignment of enlisted personnel, and the officer personnel management system.

WORK UNIT: Interface between Civilian and Military Enlisted Manpower Systems. FY 1971.

Army induction and enlistment policy is based in large part on measures of aptitudes related to likelihood of successful performance in Army jobs. A growing body of psychometric methodology is developed and applied in updating--or developing replacements for--measures of general military trainability and supplementary measures of specific aptitudes. Research products must reflect military policy and organization as well as standards for military service established by the Congress. Information is developed on screening and aptitude measures as they enter into the system of procurement of enlisted personnel, with special attention to the needs of the Modern Volunteer Army.

Instruments now in operational use include the Armed Forces Qualification Test--overall measure of trainability for both enlistees and inductees; the Army Qualification Battery, a set of short tests to evaluate specific abilities; special devices to aid in identifying deliberate failures; and the Enlistment Screening Test administered by recruiters to determine whether men seeking to enlist are likely to meet mental standards for service and should be sent on to Armed Forces Examining and Entrance Stations for further testing. Tests for women applicants for enlisted service include preenlistment screening and qualification tests.

An instrument more recently introduced is the Armed Services Vocational Aptitude Battery (ASVAB) developed in response to need for tests which could be used by all the services to test high school seniors for career counseling and as potential enlistees. Early ASVAB development was the outgrowth of an accelerated joint research program to determine which aptitude tests used by the services were sufficiently interchangeable to permit of an all-service battery. Joint service studies of the appropriateness of the current ASVAB continue, and BESRL is lead service in a research program to develop alternate ASVAB forms. The work unit has for several years engaged in methodological research on unconventional testing techniques as possible means of extracting from tests additional information predictive of soldier potential. Included are very short limited-range tests for go-no go screening, disguised aptitude tests as a new approach to detecting deliberate failures, and branching tests programmed for computer administration.

WORK UNIT: Differential Classification of Enlisted Manpower. FY 1971.

The operational objective of initial classification is to achieve optimal utilization of enlisted personnel across the range of Army jobs by matching the potential and developed skills of available manpower to training program and job requirements. The research objective is to develop and maintain measures of maximal differential value--measures highly valid for one set of Military Occupational Specialties (MOS) and of relatively low validity for other MOS. Related objectives are: 1) to determine effectiveness of classification for groups of individuals from different backgrounds, with emphasis on minority groups and 2) to provide means of more effective utilization of limited manpower resources as the Army becomes an all-volunteer force.

Emphasis of the work unit has been expanded to include a major study of conditions in the Army which affect the validity of the classification predictors. An important segment of current effort is the investigation of interactions between job environment and the effectiveness of classification tests. The Army is redesigning training courses to reduce emphasis on abstract material and increase task-oriented material so that trainees emerge with more specific skills. This change may affect the way men are assigned and utilized on the job, and in turn may alter the validity pattern of the tests of the Army Classification Battery (ACB).

The ACB was developed by BESRL to improve the classification of enlisted manpower. Recent effort has been toward improvement of the differentiating power of the battery predictors so as to better distinguish potential for success in different MOS groups. A new Army classification and aptitude area system has been developed and proposed for operational use. In research conducted on about 25,000 men in over 100 MOS training courses, the new system was found to be superior to the system in use since 1958. Initial assignments to MOS training based on the new aptitude area system will result in higher overall levels of performance. *8, 11, 13, 23, 25, 28.*

WORK UNIT: Manpower Quality and Unit Performance. FY 1971.

The work unit originated as an effort to evaluate the impact of different manpower quality mixes on Army performance--specifically to find how low enlisted mental standards might be set while maintaining acceptable levels of unit performance. While the performance of marginally qualifying personnel in individual jobs had received considerable attention, the effect of varying numbers of individuals meeting only reduced mental standards of acceptability on unit performance had not been satisfactorily investigated.

Through field research on mechanized infantry squads and motor maintenance sections in STRAF units, a hypothesis concerning the interaction between manpower quality and leadership in relation to unit activity has been developed. The main premise is that leadership effectiveness (and chain of command) moderates the impact of manpower quality on unit performance, the relationship differing for different unit activity.

Research to date has included the prediction of disciplinary problems and field observation of performance in rifle squads and motor maintenance sections. In light of this experience, the general problem has been redefined to encompass additional aspects of enlisted manpower, including racial and social group identity and situational factors in and outside the Army, as well as doctrine and leadership as determiners of both individual and unit performance. Thus, the work unit seeks to provide guidelines for small-unit leadership and to develop a coherent system of career development responsive to social change. Methods include field experiment and use of mathematical models where feasible for computer analysis of projected conditions. The effort looks to the development of models which will make it possible to estimate the effect of prospective changes in standards and to set input requirements for different force structure and mobilization plans.

WORK UNIT: Primary Officer Leadership Selection and Development. FY 1971.

Major training programs through which the Army obtains officers for commissioning are the U. S. Military Academy, the senior division of the Reserve Officer Training Corps, and the Army's officer candidate schools. Research is conducted in each of the officer procurement programs to provide means of identifying applicants who have the abilities and personal characteristics needed for military leadership in combat and technical/managerial positions. Selection for the ROTC program as the Army's major source for commissioned officers is studied with a view to developing techniques effective in identifying candidates with high leader potential. In response to a request for research assistance regarding enrollment of minority group members in the advanced ROTC course, selection instruments are being developed by which to evaluate leadership and career potential in ROTC Military Science courses. Such an evaluation system would be responsive to Army challenges of an all-volunteer Army with increased contribution from minority cultures. In the OCS program, the selection procedure is studied with the objective of developing and validating a "whole man" evaluation that will accommodate changes in quotas and quality of applicants. From completed OFFICER PREDICTION research, new instruments for selection and for performance evaluation have been developed for use in the cadet training program. At the same time, evaluation instruments are being developed for use in counseling and career guidance of cadets. Research assistance is provided the U. S. Military Academy in efforts to reduce attrition and improve evaluation of USMA graduates.

WORK UNIT: Officer Assessment for Career Development. FY 1971.

Building on findings from the OFFICER PREDICTION Work Unit concluded in FY 1970, the present work unit conducts research to develop new operational instruments for officer selection and broad classification for assignment to combat and technical/managerial positions where the men can be employed optimally for career development and Army service. The first set of such measures is to be standardized and prepared for Army-wide introduction in FY 1972, replacing certain procedures in cadet and officer selection.

The OFFICER PREDICTION Work Unit was established to provide the Army with improved techniques for identifying officers who have aptitudes and other characteristics to meet the differing demands of different officer assignments. The basic research design involved development of experimental predictors and the differential validation of the predictors against situational performance criteria and evaluations of field performance. The U. S. Army Officer Evaluation Center (OEC) at Fort McClellan staged a three-day continuous exercise which provided criterion evaluations of 900 officers previously tested with the experimental battery.

Officers originally given the experimental screening measures and still on active duty have been followed up in order to validate the predictors against performance demonstrated beyond the OEC. Evaluations of such actual performance were obtained in Vietnam, Europe, and elsewhere. In addition to the predictors and evaluation procedures developed, research findings provide valuable insights into the dimensions of officer leadership behavior in varied situational context. Behavior dimensions identified in the OFFICER PREDICTION research are being given intensive development as basis for evaluation techniques at company and early field grade level. Performance evaluation techniques are developed in conjunction with Army training exercises. Motivational measures are being explored for use at such career points as selection for Command and General Staff College. *16, 24, 26, 27, 29.*

WORK UNIT: Officer Performance Evaluation Systems. FY 1971.

DCSPER has established a priority requirement for improved officer performance evaluation and institution of a continuing record of officer performance. In response, BESRL has initiated a research program to develop new and improved officer evaluation procedures for use at career decision points and to integrate the evaluation procedures into a new comprehensive system in FY 1975.

In the early 1950's, BESRL conducted a series of major studies on rating methodology and developed a sequence of Officer Efficiency Report Forms which were capable of providing discriminating ratings. The forms did not, however, have generally favorable acceptance by officers. Subsequent rating methods have afforded more descriptive evaluations. Meantime, improved tools and techniques involving computer-assisted simulation and analysis of ratings by peers and supervisors in both group and individual situations have been the subject of experimentation in organizational and industrial settings.

Making use of the new and more fruitful constructs that have emerged, BESRL research has moved toward construction of a model defining the requirements of an officer performance evaluation based on analysis of officer assignments, school selection, and promotion policies. Included in the projected system is improved feedback to officers for career motivation and choices. Career decision points and major aspects of officer leader development have been identified in broad domains such as command, generalist, and specialist assignments. Research on the feasibility and acceptability of peer ratings in relation to promotion to colonel and general officer is under way. *15, 16, 24, 26, 27, 29.*

PERSONNEL MANAGEMENT RESEARCH-MANPOWER MANAGEMENT

Direct support is given to determination of Army policy regarding manpower for projected force levels and associated costs. Mathematical models are developed to assist in manpower planning and processing through evaluation of alternative policies regarding personnel training, selection, allocation, placement, and separation. A comprehensive model incorporating parameters such as educational level and population distribution allows decision makers to consider specific aspects of policy implementation. Methodology is developed and evaluated which builds on operations research capability, model sampling techniques, and computer technology to evaluate systems performance where the human elemen is critical and to provide means of optimizing manpower utilization. *17, 18, 19, 20, 21, 22.*

WORK UNIT: Simulation Models of Personnel Operations, SIMPO II and III. FY 1971.

Models developed in the SIMPO I and II efforts have found application at the manpower policy analyst's level as tools for both one-time assessment of the effects of proposed policy alternatives and for the periodic analysis of the projected state of the personnel management system resulting from a specified policy. The SIMPO III effort, a continuation and extension of the research accomplished under the preceding work units, will provide support for transfer of custody of SIMPO I and II models to Army operational facilities and in addition will include 1) new models as required to solve problems for which SIMPO I and II are not applicable, and 2) exploration and evaluation of techniques which offer promise of extending the usefulness of new and old personnel system simulation models.

The objective of the present effort is to develop new approaches and techniques for use in computerized models of manpower/personnel systems which management may use in evaluation of alternative policies. The effectiveness of these approaches is determined and those found satisfactory are used in the development of new models capable of solving additional kinds of manpower management problems.

The SIMPO effort includes consultation and problem formulation for model users, adaptation and exercise of models in response to user requirements, and development of special-purpose models when judged appropriate. *1.*

WORK UNIT: Operational Analysis of Enlisted Career System. FY 1971.

BESRL's basic contributions to quantitative methodology relating to the inventory, allocation, and quality control of personnel, extending back a decade or more are continued in this Work Unit. Research has been conducted to assess the feasibility of alternative approaches to optimal assignment of enlisted men, and for determining the gains that could accrue from a computerized optimal assignment procedure. The present effort investigates the effect of major changes in qualitative input (the effects of an all-volunteer Army, for example) on average predicted performance in each career field.

The major objective is to predict the effects of varying selected policies defining components of the enlisted career system. Components to be reflected include procurement, selection, initial assignment, training, promotion, reassignment, reenlistment, retirement. Variables used to simulate individuals include scores on operational and experimental classification tests, EER scores, proficiency pay test scores, time in service and on the job (by MOS and skill level). Projects initiated during FY 1971 will be continued in FY 1972 under the MANPOWER RESOURCES Work Unit. This latter effort will have increased emphasis on procurement and distribution models and the qualitative aspects of manpower planning.

HUMAN PERFORMANCE EXPERIMENTATION

Experimentation in this area involves research on behavioral functions and systems aspects related to critical tasks and subtasks common to a wide variety of Army jobs. The objective is to discover general principles which can be applied to enhance individual and team performance within the systems. Typical end products and applications are improved work methods, basis of issue and mix, work-rest cycles, supervisory techniques, information input and response output procedures. Means of improving performance that are determined to be successful in the laboratory setting are evaluated by field research in an operational setting. Research effort is responsive to the STANO program with regard to night observation devices, to ASA requirements, particularly those related to intercept operator performance, and to aspects of SAFEGUARD and TACFIRE related to controller performance.

WORK UNIT: Dependable Performance in Monitor Jobs. FY 1971.

Beginning in FY 1971, the MONITOR SKILLS Work Unit became more comprehensive in scope to meet the range and complexity of monitoring requirements arising in operational systems. In this broadened perspective, effective functioning of a monitoring system is viewed as depending on 1) how well its separate components operate and 2) how they are organized for smooth input-output flow. Human performance is critically involved

in each of these aspects of system operation. The first, which relates to performance-display functions, places emphasis on human discriminative responses evoked by signals from the equipment. The operator may be flooded with signals which may be visual or auditory, simple or complex, infrequent and embedded in noise. These and other physical characteristics of the signal determine signal discriminability which is also influenced by factors such as generalization and mediational processes within the operator. Research on the second aspect--the linking or man-man functions--focuses on organization techniques to improve feedback and other specifiable performance relationships among operators.

Work subunits under both aspects concentrate on sets of problems arising from requests of various Army and DoD elements. For most of these problems, solution requires both field and laboratory investigation.

WORK UNIT: Human Performance Experimentation in Night Operations. FY 1971.

BESRL's NIGHT OPERATIONS research is a major research effort to enhance night observation performance in military activities. Included is experimentation to determine the effects of sustained activity on human performance during night operations, the effect of prolonged use of night vision equipment, and optimum work cycles and team procedures for various targets, terrain, and conditions of illumination.

To further this research, a BESRL field experimentation unit has been established at Fort Ord, California, where, with the support of the Combat Developments Experimentation Command (CDEC), research scientists perform experiments under conditions closely approximating field operations. Research has provided information useful in the operational employment of night vision devices. Findings have helped in developing the basis of issue, provided input for training procedures, and demonstrated that improved search techniques can increase the effectiveness of the individual soldier.

Beginning in FY 1971, compass of experimentation shifted to the optimizing of performance of small units equipped with STANO subsystems and sensors. *2, 3, 4.*

WORK UNIT: Dependable Performance in Controller Jobs. FY 1971.

There is a trend toward ever greater use of computers in weapons systems through which critical control functions are performed by personnel in charge. The computer, known for its split-second response and its accuracy in performing complex calculations involving great volumes of data, is now being produced in modular ruggedized form to withstand transport over rough terrain and use under conditions of shock and vibration that might be expected on the battlefield. Where extreme speed of response is critical, there must be assurance that responsiveness of the system to human control does not defeat the purpose for which the computer is

being used. Success of computer applications to future systems may hinge largely upon man's capability to respond quickly and correctly via computer inputs, thus establishing task demands allowing no margin of error.

The CONTROLLER PERFORMANCE Work Unit conducts research on demands occurring at the man-computer interface. Current emphasis is on controller performance in air defense systems where success of computer applications rests largely with the controller's capability to respond quickly and to intervene appropriately. Task and skill analysis is applied to critical controller functions to identify tasks and task elements appearing across jobs and having potential for reducing demands on fallible human perceptual and cognitive processes. Alternative methods of achieving improved speed, accuracy, and reliability of response are devised and tested under controlled laboratory conditions and subsequently in the field.

WORK UNIT: Response Systems in Human Performance. FY 1971.

Covert human responses, generally involuntary and detectable only by instruments, have rarely been used in military situations. Exploring the possibility of such deliberate use is the focus of the present effort. Major objective is to determine whether covert response systems--a previously untapped source of information--can be usefully and reliably employed to enhance human performance in military situations, particularly in those having monitoring requirements. If under certain conditions covert responding to signals is found to be more sensitive and rapid than overt reactions, then covert responding to critical information could be deliberately established through classical conditioning.

The potential military end result is to maximize certain aspects of performance output, in effect extending the number and kind of useful responses the individual can execute concurrently.

Critical to the experimental aspect of such exploration is the development of new techniques for recording and processing electro-behavioral signals generated by the covert response systems, including devices of original design and the unique modifications of extant equipment. Substantial progress has been made in these areas, including the development of telemetry techniques and new activity detection techniques for investigation of relationships between internal responses and overt behavior.

MANNED SYSTEMS RESEARCH

Manned systems research encompasses three BESRL programs of direct relevance to Army tactical command and control and the IBCS concept--SURVEILLANCE SYSTEMS, INTELLIGENCE SYSTEMS, and COMMAND SYSTEMS. The principal objective in each of these programs is to maximize total systems effectiveness by determining the optimum allocation of functions among man, machine, and man/machine combinations, developing new work methods, aids, and procedures which capitalize on the capabilities of each, and the most appropriate man/machine/procedure configurations to facilitate an integrated total system. This objective is approached primarily through experimentation and system simulation in the BESRL computerized Information Systems Laboratory in a manner which allows relating the performance of the various system components and their interaction to total system performance.

Short-term findings provide inputs to functional design requirements, system development plans, and design specifications as well as information basic to user application and implementation. Longer term findings provide a technological base for development of advanced concepts and procedures aimed at exploiting projected ADP/computer state of the art and human capabilities for optimally effective and efficient follow-on and second generation systems.

WORK UNIT: Command Information Processing Systems. FY 1971.

The Army is developing complex automated tactical operations systems for the receipt, processing, storage, retrieval, and display of different types and vast amounts of military data. Effective performance of these systems depends ultimately on the human component. Research under this effort has yielded the following results: Basic human factors problems were identified and organized around five critical information processing operations--screening incoming data, transforming raw data for input into storage-retrieval devices, input of information, assimilation of displayed information, and decision making. An experimental facility was developed in which various aspects of tactical functions can be simulated. A Command Systems Field Branch, located within the Seventh Army TOS Development Group in USAREUR, performed research in an operational setting and furnished human factors assistance to TOS evaluation efforts. This field effort also infused the laboratory research program with operationally derived problems, the solutions to which have direct implications for basic system design specifications for TOS follow-on activities. This same field effort approach, on a broader scale, has recently been implemented within Project MASSTER at Fort Hood, Texas. Work on input operations includes development and evaluation of new entry devices and procedures for source data automation.

Experimental research completed or in progress on information assimilation and decision making include the effects on performance of such information factors as coding, level of specificity, alpha-numeric versus graphic format, tote versus graphic displays, rate and degree of updating, and individual versus team procedures. In addition, an analytic study to develop a comprehensive taxonomy of command display characteristics is in progress. System performance measures have been developed which provide design data for configuring man/machine transformation, input, and verification operations in TOS-like systems. The experimental attack on proficiency maintenance within a tactical computer setting has recently been initiated. The body of research results delineates human performance capabilities and limitations and have implications for increasing the efficiency of the information assimilation-decision process and improved work methods. *9, 10, 12, 14.*

WORK UNIT: Information Processing in Advanced Image Interpretation Systems. FY 1971.

The need to handle large volumes of imagery from a variety of sources in tactical interpretation facilities demands critical examination of the tasks and duties of the interpreter, his displays, and the total information system. Early studies established the necessity for enhancing both the accuracy and completeness of interpretation to meet the crucial demands of modern tactical operations. An expanded research effort was formulated in FY 1971 to apply to the broad area of surveillance systems. The research is conducted as an in-house effort, augmented by contracts with organizations selected as having superior capabilities and facilities for research in aerial surveillance. Within BESRL, an Information Systems Laboratory has been established in which computerized equipment is used to simulate variations in imagery display modes and other aspects of information processing as well as to assess concepts and alternative system configurations. Focus is on developing work methods and procedures which, through the most efficient use of human abilities, maximize the accuracy, completeness, and speed with which intelligence information is derived from imagery.

BESRL findings indicate that many factors influence performance: the imagery, its content, quality, and scale; the requirements placed on the interpreter in terms of accuracy, completeness, and speed; the man, his ability, background, and experience; the display and the system within which the interpreter operates.

Research concerns interpreter activities with emphasis on cues and signatures for tactical targets with the objective of improving such functions as screening interpretation, target location, plotting and mensuration. The interface relating human performance to display characteristics is investigated. *5.*

WORK UNIT: Intelligence Information Processing Systems. FY 1971.

The need for continually updating intelligence appraisals while absorbing and evaluating incoming information from a great variety of sources imposes a severe burden on the intelligence analyst in the field army. He must judge source reliability and information accuracy, determine relevance and decay rates, and consider information gaps while integrating and interpreting large amounts of different kinds of information.

Emphasis in BESRL's INTELLIGENCE SYSTEMS Work Unit is on the critical human functions of analysis and interpretation and other directly supportive functions. The aim is to identify automated data handling techniques, computer aids, and procedural and analytic techniques which will greatly enhance speed and accuracy and utility of intelligence analysis and prediction. Valid and timely assessments of capability and prediction of intention from intelligence information depend upon appropriate man/machine utilization. Achieving balance between man and machine depends, in turn, on the determination of functions that must be left to the man in the system and those that can be automated wholly or in part, and development of effective analytic methods and man/machine interaction techniques. Inputting, preprocessing, display, and dissemination functions are researched to tailor these functions to meet the analyst's requirements and ascertain the need to accommodate direct input from a wide variety of sensors.

Research to date has provided a delineation of current production methods, a basic understanding of the nature of the parameters involved, possible computer innovations, definition of critical researchable problems, structuring of a systematic approach, conceptualization of a model of intelligence processing, and development of a computerized G2 data base for empirical simulation. A preliminary structured diagnostic model and interactive graphic display procedures have been developed and readied for experimental evaluation. Data were collected on the effects of information reliability, quantity, and costs on information seeking behavior.

WORK UNIT: Basic Characteristics of Image Interpretation Performance Measures. FY 1971.

Beginning in FY 1965, the Technical Support Branch of BESRL's Support Systems Research Division has amassed an aerial film library for use in research in image interpretation. From this imagery, performance measures are developed to meet specific research requirements.

Psychometric characteristics of the performance measures--means, variance, item difficulty, test reliability, intercorrelation, and part-whole correlation--are determined through analysis of data obtained by administering the tests to trained image interpreters. This information is used to select the best performance measures available for given research needs and also to develop indices for matching groups of experimental subjects.

A compendium of performance measures that have been used in BESRL image interpretation research has been prepared. Collection and analysis of the material and of the performance measures continues.

TECHNICAL ADVISORY SERVICE

BESRL research scientists provide technical advisory services to various elements of military management on a wide range of behavioral science problems. Services include consultative assistance on application of research findings to operational problems, evaluation of personnel and manpower policies and proposals and implications of concepts emerging from research, assistance with problems of research planning, design of experiments, interpretation of findings, evaluation of concepts and contractor proposals in the area of human performance and manned systems research, and participation in study and planning groups Army- and service-wide, such as ad hoc working groups for the Manpower Management Planning Board on interservice problems, the Army Mathematics Steering Committee, the Armed Forces-NRC Vision Committee, the Joint Chiefs of Staff ISCIG Multi-Sensory Correlating Committee, STANO, and project MASSTER.

IN-HOUSE LABORATORY INDEPENDENT RESEARCH (ILIR) FY 1971.

A limited portion of the research effort of the Behavior and Systems Research Laboratory is devoted to the conduct of original research on subjects that need to be pursued because of possible long-range significance for military developments but that are of less immediate applicability than the main body of research conducted. Scientific talent is directed toward the exploration of new developments in experimental psychology, psychometrics, statistical-mathematical models and other operations research methodology. Laboratory capability may thus be extended in terms of knowledge, techniques, and facilities that may ultimately be applicable in research on a wide range of Army activities. *17, 18, 19, 20, 21, 22.*

DEPOSITORY LIBRARIES

BESRL Research Publications

BESRL Technical Research Reports and Research Notes are on file in each of the following libraries, listed by state.

Alabama

University of Alabama Library
Reference Department
University, Alabama 35486

Auburn University
Ralph Brown Draughon Library
Serials Department
Auburn, Alabama 36830

Alaska

University of Alaska Library
Government Documents Division
College, Alaska 99735

Arizona

Arizona State University
Matthews Library
Documents Librarian
Tempe, Arizona 85281

University of Arizona Library
Documents Service
Tucson, Arizona 85721

California

University of California
General Library
Documents Department
Berkeley, California 94720

California (Continued)

University of California Library
Public Affairs Service
University Research Library
405 Hilgard Avenue
Los Angeles, California 90024

California State Library
Documents Section
Sacramento, California 95809

San Diego State College Library
San Diego, California 92115

The Honnold Library
Documents Department
Claremont, California 91711

University of California Library
Documents Section
Riverside, California 92502

University of California Library
Government Publications Department
Santa Barbara, California 93106

California State College at Los Angeles
John F. Kennedy Memorial Library
Documents Section
5151 State College Drive
Los Angeles, California 90032

California State College at Hayward
College Library - Documents Dept. E-585
25800 Hillary Street
Hayward, California 94546

California (Continued)

The Library
Occidental College
1600 Campus Road
Los Angeles, California 90041

Documents Section
The University Library
University of California
Santa Cruz, California 95060

Chico State College Library
Chico, California 95927

Fresno State College Library
Government Publications Department
Fresno, California 93726

University of California Library
Documents Department
Davis, California 95616

Library, University of
Southern California
700 West 35th Place
Los Angeles, California 90007

University of California Library
Government Publications Section
Irvine, California 92650

San Fernando Valley State College
Library - Acquisitions Department
18111 Nordhoff Street
Northridge, California 91324

San Francisco State College Library
1630 Holloway Avenue
San Francisco, California 94132

Connecticut

Wesleyan University Library
Middletown, Connecticut 06457

University of Bridgeport Library
Bridgeport, Connecticut 06602

Delaware

University of Delaware
Morris Library
Documents Department
Newark, Delaware 19711

District of Columbia

Library of Congress
Washington, D. C. 20540

Florida

Florida State University Library
Documents Division
Tallahassee, Florida 32306

University of Florida
The University Libraries
Documents Section
Gainesville, Florida 32603

Georgia

University of Georgia
The University Libraries
Documents Section
Athens, Georgia 30602

Hawaii

University of Hawaii Library
Government Documents Collection
2425 Campus Road
Honolulu, Hawaii 96822

Illinois

University of Illinois Library
Documents Division
Urbana, Illinois 61803

Northwestern University Library
Documents Department
Evanston, Illinois 60201

Illinois (Continued)

University of Chicago Library
Documents Librarian
Chicago, Illinois 60637

Illinois State University
Milner Library
Acquisitions Department
Normal, Illinois 61761

Southern Illinois University
The General Library
Serials Department
Carbondale, Illinois 62903

Nothern Illinois University
Library
Documents Department
De Kalb, Illinois 60115

Western Illinois University Library
Documents Librarian
Macomb, Illinois 61455

University of Illinois
at Chicago Circle
Documents Section
P. O. Box 8198
Chicago, Illinois 60680

Southern Illinois University
Lovejoy Library
Edwardsville, Illinois 62025

Sangamon State University Library
Documents Department
Springfield, Illinois 62703

Illinois State Library
Centennial Building
Government Documents Branch
Springfield, Illinois 62706

Indiana

Purdue University Libraries
U. S. Documents Office
Lafayette, Indiana 47907

Indiana (Continued)

Indiana State Library
Documents Librarian
140 North Senate Avenue
Indianapolis, Indiana 46204

Indiana University Library
Documents Librarian
Bloomington, Indiana 47405

Indiana State University
Cunningham Memorial Library
Documents Library
Terre Haute, Indiana 47809

Ball State University Library
Government Publications
Muncie, Indiana 47306

University of Notre Dame
Acquisitions Department (277449A)
Memorial Library
Notre Dame, Indiana 46556

Iowa

University of Northern Iowa
Library - Serials - A
Cedar Falls, Iowa 50613

Iowa State University of Science
and Technology
The Library
Ames, Iowa 50010

Cowles Library
Drake University
Des Moines, Iowa 50311

Kansas

University of Kansas Library
Documents Librarian
Lawrence, Kansas 66045

Kansas State University Library
Documents Division
Manhattan, Kansas 66502

Kentucky

University of Kentucky
The University Libraries
Continuation Division
Acquisition Department
Lexington, Kentucky 40506

Western Kentucky University
Library
Director of Library Services
Bowling Green, Kentucky 42101

Louisiana

Louisiana State University Library
Government Documents Department
Baton Rouge, Louisiana 70803

Maine

University of Maine
Raymond H. Fogler Library
Documents Librarian
Orono, Maine 04473

Maryland

University of Maryland
McKeldin Library
Social Science Department
College Park, Maryland 20742

Johns Hopkins University Library
Acquisitions
Baltimore, Maryland 21218

National Library of Medicine
Selection/Acquisition Section
8600 Rockville Pike
ATTN: AREA 2, TS/S/A
Bethesda, Maryland 20014
STOP 216

Massachusetts

University of Massachusetts Library
Government Documents Collection
Amherst, Massachusetts 01003

Massachusetts (Continued)

Boston College
Bapst Library
Serials Librarian
Chestnut Hill, Massachusetts 02167

Michigan

Detroit Public Library
5201 Woodward Avenue
Detroit, Michigan 48202

University of Michigan
The General Library
Documents Librarian
Ann Arbor, Michigan 48104

Michigan State University Library
Documents
East Lansing, Michigan 48823

Wayne State University Library
Documents Librarian
Detroit, Michigan 48202

Western Michigan University
Dwight B. Waldo Library
Documents Library
Kalamazoo, Michigan 49001

Central Michigan University Library
Documents Section
Mt. Pleasant, Michigan 48858

Minnesota

University of Minnesota
Walter Library
Documents Division
Minneapolis, Minnesota 55455

Mississippi

University of Southern Mississippi
Library
P. O. Box 53, Station A
Hattiesburg, Mississippi 39401

Missouri

University of Missouri Library
Serials - Documents
Columbia, Missouri 65202

Nebraska

University of Nebraska Library
Documents Librarian
Lincoln, Nebraska 68508

New Hampshire

Dartmouth College
Baker Library
Reference Department
Hanover, New Hampshire 03755

Documents, The Library
University of New Hampshire
Durham, New Hampshire 03824

New Jersey

Princeton University Library
Documents Librarian
Princeton, New Jersey 08540

Rutgers University Library
Periodical Department
New Brunswick, New Jersey 08901

New Mexico

University of New Mexico
Zimmerman Library
Serials Department
Albuquerque, New Mexico 87106

New York

Brooklyn Public Library
Documents Division
Grand Army Plaza
Brooklyn, New York 11238

New York (Continued)

Columbia University Libraries
Documents Acquisition
535 West 114th Street
New York, New York 10018

Cornell University Libraries
Government Documents
Ithaca, New York 14850

New York Public Library
Government Documents
5th Avenue and 42nd Street
New York, New York 10018

New York State Library
Gift and Exchange Section
Albany, New York 12224

Syracuse University
The Library
Serials Division
Syracuse, New York 13210

Documents Librarian
Hunter College of the
City University of New York
695 Park Avenue
New York, New York 10020

United Nations
Dag Hammarskjold Library
Acquisition Section
New York, New York 10017

State University College Library
Documents Librarian
Potsdam, New York 13676

State University of New York
SUNY at Stony Brook
Main Library, Documents Section
Stony Brook, New York 11790

State University College
James M. Milne Library
Assistant Librarian
Oneonta, New York 13820

New York (Continued)

Hofstra University Library
Documents Department
Hempstead, New York 11550

Association of the Bar of the
City of New York
42 West 114th Street
New York, New York 10036

Nassau Library System
Reference Department
Lower Concourse, Roosevelt Field
Garden City, New York 11530

State University of New York
at Binghamton
The Library - Documents Section
Vestal Parkway East
Binghamton, New York 13901

Law Library
New York University
Washington Square
New York, New York 10003

State University of New York
at Buffalo
Lockwood Memorial Library
Documents Division
Buffalo, New York 14214

North Carolina

Duke University Library
Public Documents Division
Durham, North Carolina 27706

North Carolina State University
D. H. Hill Library
Raleigh, North Carolina 27607

University of North Carolina
The Library
BA/SS Division - Documents
Chapel Hill, North Carolina 27515

Ohio

Bowling Green State University Library
Documents Department
Bowling Green, Ohio 43402

Kent State University Library
Documents Librarian
Kent, Ohio 44240

Ohio University Library
Documents Section
Athens, Ohio 45701

Miami University Library
Reference Department
Oxford, Ohio 45056

Ohio State University Libraries
Documents Division
1858 Neil Avenue
Columbus, Ohio 43210

Oberlin College Library
Documents Librarian
Reference Department
Oberlin, Ohio 44074

Librarian Technician - Documents
University Library
University of Akron
Akron, Ohio 44304

Serials Librarian
Wittenburg University Library
ATTN: Serials
Springfield, Ohio 45501

Serials Librarian
Olive Kettering Library
Antioch College
Yellow Springs, Ohio 45387

Oklahoma

Central State College
Max Chambers Library
Documents Department
Edmond, Oklahoma 73034

Oklahoma (Continued)

Oklahoma State University
The Library
Documents Librarian
Stillwater, Oklahoma 74075

Oregon

Portland State University Library
P. O. Box 1151
Portland, Oregon 97207

Pennsylvania

Free Library of Philadelphia
Department of Public Documents
Philadelphia, Pennsylvania 19103

Carnegie Library of Pittsburgh
Reference Department
Pittsburgh, Pennsylvania 15213

University of Pittsburgh
Hillman Library
Documents Office, G-8
Pittsburgh, Pennsylvania 15213

Temple University
Samuel Paley Library
Documents Room
Philadelphia, Pennsylvania 19122

Pennsylvania State University
The University Library
Documents
University Park, Pennsylvania 16802

Rhode Island

Brown University Library
Documents Division
Providence, Rhode Island 02912

University of Rhode Island
The Library
Kingston, Rhode Island 02881

South Carolina

University of South Carolina
McKissick Memorial Library
Documents Department
Columbia, South Carolina 2920[illegible]

Tennessee

University of Tennessee Library
Documents Librarian
Knoxville, Tennessee 37916

Joint University Libraries
Serials and Documents
Nashville, Tennessee 37203

Texas

Dallas Public Library
Documents Librarian
Dallas, Texas 75201

University of Texas
Documents Librarian
The Law Library
2500 Red River
Austin, Texas 78705

University of Texas Library
Documents Acquisitions
Austin, Texas 78712

University of Texas at Arlington
Library - Documents
Arlington, Texas 76010

Utah

University of Utah
Library Periodical Room
Salt Lake City, Utah 84112

Brigham Young University Library
Documents Section
Provo, Utah 84601

Vermont

University of Vermont
Documents Librarian
Guy W. Bailey Library
Burlington, Vermont 05401

Lyndon State College Library
Lyndonville, Vermont 05851

Virginia

University of Virginia
Alderman Library
Public Documents
Charlottesville, Virginia 22903

Washington

University of Washington Library
Documents Librarian
Seattle, Washington 98105

Washington State University Library
Serial Record Section
Pullman, Washington 99163

Washington State Library
Library Building
Olympia, Washington 98501

West Virginia

West Virginia University Library
Reference Department
Morgantown, West Virginia 26506

Wisconsin

Milwaukee Public Library
Acquisition Division
814 West Wisconsin Avenue
Milwaukee, Wisconsin 53233

University of Wisconsin-Milwaukee
The Library
2500 E. Kenwood Boulevard
Milwaukee, Wisconsin 53211

Wisconsin State University
The Library
Stevens Point, Wisconsin 54481

Wyoming

University of Wyoming
The Library
Documents Librarian
Laramie, Wyoming 82071

U. S. ARMY PERSONNEL PROGRAMS

utilizing psychological research test products of the Behavior and Systems Research Laboratory

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Pre-enlistment Screening of Male Enlistment Applicants	
To screen men enlisting or reenlisting from civilian life who must be tested prior to traveling to Armed Forces Examining Stations for Armed Forces Qualification Test (AFQT) administration.	
Tests: Enlistment Screening Test, EST.	400,000
Screening of Male Enlistment Applicants	
To screen men on mental acceptability prior to enlistment at AFEES.	
Tests: Armed Forces Qualification Test, AFQT.	400,000
Army Qualification Battery, AQB	350,000
Pre-enlistment Screening of Female Enlistment Applicants	
To screen women enlisting or reenlisting from civilian life who must be tested prior to traveling to Armed Forces Examining Stations for Armed Forces Women's Selection Test (AFWST) administration.	
Tests: Women's Enlistment Screening Test, WEST.	11,500
Screening of Female Enlistment Applicants	
To screen women for mental acceptability prior to enlistment.	
Tests: Armed Forces Women's Selection Test, AFWST.	
Women's Army Classification Battery, WACB.	8,500
Screening and Counseling of Male High School Seniors	
To screen high school seniors and provide guidance regarding their aptitude potential for Army jobs.	
Test: Armed Services Vocational Aptitude Battery	350,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Enlistment Screening of Male Reserve and National Guard Applicants	
To screen men for mental acceptability prior to enlistment in the Army Reserve or the Army National Guard.	
Tests: Armed Forces Qualification Test, AFQT (Reserve Components Edition). Army Qualification Battery, AQB (Reserve Components Edition).	75,000
Screening of Selective Service Registrants	
To screen Selective Service Registrants for mental acceptability prior to induction.	
Tests: Armed Forces Qualification Test, AFQT.	752,000
Army Qualification Battery, AQB.	80,000
Detecting Deliberate AFQT Failures	
To aid personnel psychologist in verifying AFQT failures among Selective Service Registrants with percentile scores of 0 through 9 on AFQT.	
Tests: Included within Terminal Screening Procedures.	45,000
Screening of Insular Puerto Rican Selective Service Registrants	
To screen Selective Service Registrants in Puerto Rico who must undergo mental acceptability testing in Spanish prior to induction into the Army for training.	
Tests: Examen Calificación de Fuerzas Armadas, ECFA. English Fluency Battery, EFB. Army Classification Battery, ACB.	12,000
Initial Classification of Enlisted Male Personnel	
To determine MOS appropriate for direct award, and MOS recommended for advanced training of replacement stream enlisted personnel processed through Reception Stations.	
Tests: Army Classification Battery, ACB. (Standard Scores on 11 tests are converted into 8 Aptitude Area composites.)	300,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Initial Classification of Motor Vehicle Drivers To screen individuals during Reception Station processing as a prerequisite to licensing for driver assignments. Tests: Motor Vehicle Driver Selection Battery I, MDB-I	300,000
Selection of Basic Trainees for Training as Acting NCOs To select basic trainees for training as acting NCOs. Selection is based on peer ratings of leadership potential obtained during the fifth week of Basic Combat Training. Individuals selected are given two weeks of NCO training upon completion of their Basic Combat Training, and serve as acting NCOs during Advanced Individual Training. Tests: Leadership Potential Rating, LPR. (This procedure consists of a ranking procedure within training squads, followed by a rating of leadership potential on a seven-point scale.)	300,000
Licensing Drivers of Army Motor Vehicles To determine qualifications of military personnel, civilians, and indigenous personnel for standard driver licenses. Tests: Motor Vehicle Driver Selection Battery II, MDB-II (unless previously qualified on MDB-I). Testing Procedures for Licensing Drivers of Army Motor Vehicles: Includes physical evaluation and driving performance test.	122,000
Selection of Personnel for Foreign Language Training To screen personnel for foreign language aptitude as a prerequisite for application for training at the Army Language School. Tests: Defense Language Aptitude Test, DLAT	100,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Measurement of Foreign Language Proficiency To determine the extent to which military personnel meet qualifying standards of proficiency in specified foreign languages. Tests: DOD Language Proficiency Tests in the following languages: Albanian, Arabic-Egyptian, Arabic-Iraqui, Arabic-Syrian, Bulgarian, Burmese, Chinese Cantonese, Chinese Mandarin, Czech, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Icelandic, Indonesian, Italian, Japanese, Korean, Lithuanian, Norwegian, Persian, Polish, Portuguese, Portuguese-Brazilian, Romanian, Russian, Serbo-Croatian, Slovenian, Spanish-Latin American, Spanish-European, Swahili, Thai, Turkish, Ukrainian, Vietnamese-Hanoi, Vietnamese-Saigon, Yiddish.	35,000
Measurement of Skill in Shorthand and Typing To obtain typing and dictation scores for those enlisted personnel undergoing reception station processing who claim skill in typing and shorthand. Scores obtained are used in determining the individual's most appropriate training and assignment. Tests: Typing and Dictation Test.	Data not available
Selection for Training and Assignment in Special Forces Organizations To determine the aptitude of enlisted volunteers in the Active Army and in the Army Reserve for training and assignment in Special Forces organizations. Tests: Special Forces Selection Battery, consisting of: a. Special Forces Locations Test, SFL. b. Critical Decisions Test, CDT. c. Special Forces Suitability Inventory, SFI.	5,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Selection of Personnel for Training as Army Aviators	
To screen male personnel who volunteer for fixed-wing or rotary-wing aviator training courses.	
Tests: 1. For administration to officers applying for officer aviator courses. Flight Aptitude Selection Tests, FAST	4,000
2. For administration to enlisted men and enlistment option applicants volunteering for Warrant Officer Candidate aviation courses. Flight Aptitude Selection Tests, FAST.	10,000
Selection of ROTC Cadets for Fixed-Wing Aviation Training	
To select ROTC Cadets for fixed-wing aviation flight training.	
Tests: Army Fixed-Wing Aptitude Battery	2,000
Selection of Cadets for Junior College ROTC Training	
To select students at Military Schools Division Army ROTC units established at secondary level and junior college educational institutions for MST-5 and MST-6 ROTC training.	
Tests: General Screening Test, GST. (Testing occurs during senior high school year.)	1,000
Selection of Cadets for Senior Division Advanced ROTC Training	
To select cadets for Senior Division Advanced ROTC training from among students who are successfully completing or receiving credit for basic course (first two years college).	
Tests: ROTC Qualifying Examination, RQ. (Testing occurs during sophomore college year.)	10,000
Selection of Male Officer Personnel for Training as Army Image Interpreters	
To determine qualifications of Army Intelligence and Security Branch (AIS) officers for training as Army image interpreters.	
Tests: Image Interpreter Selection Battery consisting of:	
a. Image Orientation Test	
b. Image Interpreter Information Test	500

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Selection of Male Personnel for Officer Candidate School	
To screen Warrant Officers and enlisted men in the Active Army and in the Army Reserve not on active duty who are applying for Officer Candidate School. Minimum scores on Aptitude Area GT and Officer Candidate Test, OCT are required as a prerequisite to administration of the Officer Candidate Selection Battery to Active Army applicants.	60,000
Tests: Officer Candidate Selection Battery, consisting of:	
a. Officer Leadership Qualification Report, OLR-1.	
b. Officer Qualification Inventory, OQI-1.	
c. Officer Leadership Board Interview, OLB-1.	10,000
Selection of Female Personnel for Officer Candidate School	
To screen Warrant Officers and enlisted women in the Active Army and in the Army Reserve not on active duty who are applying for Officer Candidate School.	
Tests: WAC Officer Candidate Selection Battery, consisting of:	
a. WAC OCS Biographical Information Blank.	
b. WAC Officer Candidate Applicant Interview.	
c. WAC Officer Candidate Applicant Evaluation Report. (Minimum score on Aptitude Area GT required as a prerequisite to administration of the WAC Officer Candidate Selection Battery to Active Army applicants.)	150
Appointment of Male Personnel as Reserve Warrant Officers	
To select enlisted men in the Active Army and in the Army Reserve not on active duty for appointment as Reserve Warrant Officers.	
Tests: 1. For administration to enlisted men in the Active Army (except avaiation):	
a. Officer Qualification Inventory, OQI-1.	
b. Officer Leadership Board Interview, OLB	
c. Officer Leadership Qualification Report, OLR	
2. For administration to enlisted men not on active duty (except aviation):	
a. Officer Qualification Inventory, OQI-1.	
b. Officer Leadership Board Interview, OLB	
c. Interview Appraisal Sheet S	3,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Appointment of Female Personnel as Reserve Warrant Officers To select enlisted women in the Active Army and in the Army Reserve not on active duty for appointment as Reserve Warrant Officers. Tests: WAC OCS Biographical Information Blank. WAC Officer Candidate Applicant Officer Interview. Interview Appraisal Sheet S.	10
Appointment of Male Personnel to Commissions in the United States Army Reserve To select male personnel in the following categories for appointment to commissions in the United States Army Reserve: Warrant Officers and enlisted men currently serving in any component of the Army; Reserve Warrant Officers and enlisted men who are currently serving in an active status in the Army Reserve; and former warrant officers and enlisted men. Tests: Officer Qualification Inventory, OQI-1. Officer Leadership Board Interview, OLB. Interview Appraisal Sheet M (for use with all applicants except technical experts or specialists) or Interview Appraisal Sheet S (for use with technical experts or specialists).	8,000
Appointment of WAC Personnel to Commissions in the United States Army Reserve To select female personnel in the following categories for appointment to commissions in the United States Army Reserve: Warrant Officers and enlisted women currently serving in any component of the Army; Reserve Warrant Officers and enlisted women who are currently serving in an active status in the Army Reserve, and former warrant officers and enlisted women. Tests: WAC OCS Biographical Information Blank. WAC Officer Candidate Applicant Interview. Interview Appraisal Sheet M (for use with all applicants except technical experts or specialists) or Interview Appraisal Sheet S (for use with technical experts or specialists).	600

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Appointment of Male Personnel to Commissions in the Regular Army To select male personnel in the categories indicated below for appointment to commissions in the Regular Army. Tests: 1. For administration to officers on active duty, to former commissioned officers, and to applicants for commissions in Corps of the Army Medical Service: a. Interview Blank, Form 4. b. Biographical Information Blank, Form F. 2. For administration to Warrant Officers and enlisted men on active duty and to former Warrant Officers and enlisted men: a. Officer Qualification Inventory, OQI-1. b. Officer Leadership Boare Interview, OLB. c. Officer Leadership Qualification Report, OLR. 3. For administration to ROTC Distinguished Military Graduates: a. ROTC Inventory, RI. b. ROTC Evaluation Report, ROE-2. 4. For administration to technical specialists possessing advanced degrees or possessing bachelor's degree with appropriate experience: a. Interview Blank, Form 4. b. Biographical Information Blank, Form F. c. Interview Appraisal Sheet S. 5. For administration to scholastically outstanding graduates of accredited colleges and universities who did not take ROTC training for valid reasons: a. ROTC Inventory, RI. b. Officer Leadership Board Interview, OLB.	2,000

PROGRAM	NUMBER OF APPLICANTS TESTED ANNUALLY
Appointment of Female Personnel to Commissions in the Regular Army To select female personnel in the categories indicated below for appointment to commissions in the Regular Army. Tests: 1. For administration to warrant officers and enlisted women on active duty and to former warrant officers and enlisted women: a. WAC Officer Candidate Applicant Interview. b. WAC Officer Candidate Applicant Evaluation Report. c. WAC OCS Biographical Information Blank. 2. For administration to applicants for Regular Army commissions in the Army Nurse Corps, the Women's Medical Specialist Corps, and the Medical Corps: a. Board Interview for Officers in the Army Medical Service. b. Biographical Information Blank for Women Officers in the Army Medical Service, BIB-AMS.	50